Ruffneck™
Heaters for the Harshest Environments

Certified System™
ISO 9001

Owner's Manual

FX4 Series

Electric Forced Air Heaters for Hazardous Locations

This manual covers the installation, maintenance, repair and replacement parts.

APPROVED LOCATIONS

The Electric Forced Air Heaters are UL listed and/or CSA certified for the following locations:

Class I, Divisions 1 & 2, Groups C & D;
Class II, Division 1, Groups E, F, & G;
Class II, Division 2 , Groups F & G;
Class I, Zones 1 & 2, Groups IIA & IIB;
Temperature Code T3B 165˚C (329˚F)
(50 Hz & 60 Hz Models)

For details of hazardous locations with potential for explosion, refer to the Canadian Electrical Code, Part 1, Section 18 or National Electrical Code articles 500-516.

MODEL CODING

FX 4 - 480 3 60 - 350

- 350 — KILOWATT RATING
- 60 — HERTZ
- 3 — PHASE
- 480 — VOLTAGE
- 4 — 4th GENERATION
- FX — MODEL SERIES

WARNING!
READ ALL IMPORTANT NOTICES ON PAGE 3.

Part No. 5031.Rev.15.04 Issue Date: April 2012 Printed in Canada

Ruffneck™ and VacuCore® are registered trademarks of CCI Thermal Technologies Inc.
Copyright© 2012. All rights reserved.

HEATER MAINTENANCE CHECKLIST

For Electric Forced Air Heaters

Photocopy this page for reuse.

Heater Model: _____ Serial No.: _____

Date of Maintenance: _____ Maintenance Done By: _____

Comments: _____

_____

WARNING

Disconnect heater from power supply at fuse box before opening enclosures or servicing heater.
Lock the switch in the "OFF" (open) position and/or tag the switch to prevent unexpected power application.
This heater should only be serviced by personnel with heating and hazardous location equipment experience.

PERIODIC (before and as required during heating season)

1. CLEAN
   - ☐ Finned Tubes
   - ☐ Fan
   - ☐ Fan Guard
   - ☐ Motor
   - ☐ Louvers

2. CHECK
   - ☐ Motor for smooth, quiet operation
   - ☐ Louvers for proper angle and tightness
   - ☐ All explosion-proof covers for tightness
   - ☐ Pressure relief device for signs of leakage. See Figure 1 and refer to the ANNUAL Section (see below) item 2 for further instructions.

Remove dust using compressed air. Do not spray with water or solvents.
Do not immerse in water or solvents.

ANNUAL (before heating season)

1. ELECTRICAL
   - ☐ **Check all terminal connections and conductors.** Tighten loose connections. Conductors with damaged insulation must be replaced.
   - ☐ **Inspect contactor contacts.** If badly pitted, burned or welded shut, replace with factory supplied contactor. For severe duty conditions such as arctic duty, CCI Thermal recommends the contactor be replaced every two years.
   - ☐ **Check fuses.** Fuse rating and type are on printed circuit board. Correct fuse must be in the active fuse clip. It is recommended that a spare fuse be stored in the spare fuse clip.
   - ☐ **Check all explosion-proof conduits.** Replace damaged conduits. All threaded conduit connections must have a minimum 5 turns engagement. Straight threaded conduit must protrude a minimum of 1/16" (1.6mm) inside enclosures. Taper threaded connections must be at least hand tight.
   - ☐ **Check electrical resistance on all load side legs.** Reading should be balanced (± 5%).

2. MECHANICAL
   - ☐ **Check for fluid leakage.** The heater core is vacuum charged and contains propylene glycol. Inspect the Pressure Relief Valve label indicator for signs of rupture and degradation. If the paper is torn, disintegrated or otherwise compromised this is an indication that fluid has leaked from the core. If any fluid leakage occurs from the heater, disconnect it from the power supply and have the core replaced. A factory supplied exchange core can be shipped immediately from stock. Refer to the "repair and Replacement" section for details.
   - ☐ **Check all enclosures.** Interior of enclosures must be clean, dry and free of foreign materials. Threaded covers must be installed and hand tight.
     Note: Enclosure joints are metal to metal. Do not use gasket material or sealant in joints. A grease is applied to the joints at the factory and should be left intact.
   - ☐ **Check motor shaft bearing play.** Replace motor if play is excessive, or if motor does not run quietly and smoothly. Motor bearings are permanently lubricated.
   - ☐ **Check fan.** Replace immediately if cracked or damaged.
   - ☐ **Check louvers.** Louver screws should be tight. Louvers shall not be fully closed or override stops.
   - ☐ **Check the tightness of all hardware.** All nuts and bolts, including mounting hardware, must be tight.

Photocopy this page for reuse.

ANNUAL (Continued)

☐ **Turn heater on for a minimum of five minutes.** Check for warm air exiting heater through louvers. Crackling or pinging noises within heater during start-up are normal.

IMPORTANT NOTICES

WARNING

Read and adhere to the following. Failure to do so may result in severe or fatal injury.

1. Read and follow all instructions in this manual.
2. Heater is to be used only in atmospheres having an ignition temperature higher than the heater's maximum rated operating temperature as shown on the heater data plate. Refer to applicable electrical codes for additional information.
3. Heater to be used only in the hazardous locations indicated on the heater's data plate.
4. Heater is for dry indoor use only. Do not immerse in water. Do not store or use in areas exposed to rain or snow.
5. Heater is to be connected and serviced only by a qualified electrician experienced with hazardous location equipment.
6. Installation and wiring of the heater must adhere to all applicable codes.
7. Disconnect heater from power supply at integral disconnect or fuse box before opening enclosures or servicing heater. Lock the switch in the "OFF" (open) position and/or tag the switch to prevent unexpected power application.
8. This heater is equipped with a single bimetal overtemperature high-limit. It is of the automatic reset type and therefore the heater may restart without warning. The heater is not to be operated with the high-limit disabled or disconnected from the control circuit.
9. Venting pressure of the pressure relief valve is factory set. Do not tamper with lock nut.
10. Do not tamper or remove warning label indicator on the PRV (figure 1).
11. Operate the heater only while it is permanently mounted in an upright position. Refer to the "Installation - Mechanical" section for details.
12. Heater must be kept clean. When operating in a dirty environment, regularly clean the finned tubes, fan, and fan guard. Follow the recommended maintenance procedures. Refer to the "Heater Maintenance Checklist" section for details.
13. The heater core is vacuum charged and contains propylene glycol. **If any fluid leakage occurs from the heater, disconnect it from the power supply and have the core replaced with a factory supplied core. Refer to the "Repair and Replacement" section for details.**
14. Do not operate the heater with any of the louvers fully closed or overriding their stops.
15. Do not operate the heater in atmospheres corrosive to steel or aluminum.
16. Do not operate heater in ambient temperatures above 40°C (104°F).
17. Use factory approved replacement parts only.
18. See applicable electrical codes for seal requirements in field installed conduits. Factory installed conduits require no further sealing.
19. Crackling or pinging noises within the heater core during start up may occur. This is normal.
20. Air discharge near the bottom of the heater may be warmer than the top. This is normal.
21. If there are any questions or concerns regarding the heater, contact the factory. Refer to the last page of this manual for details.

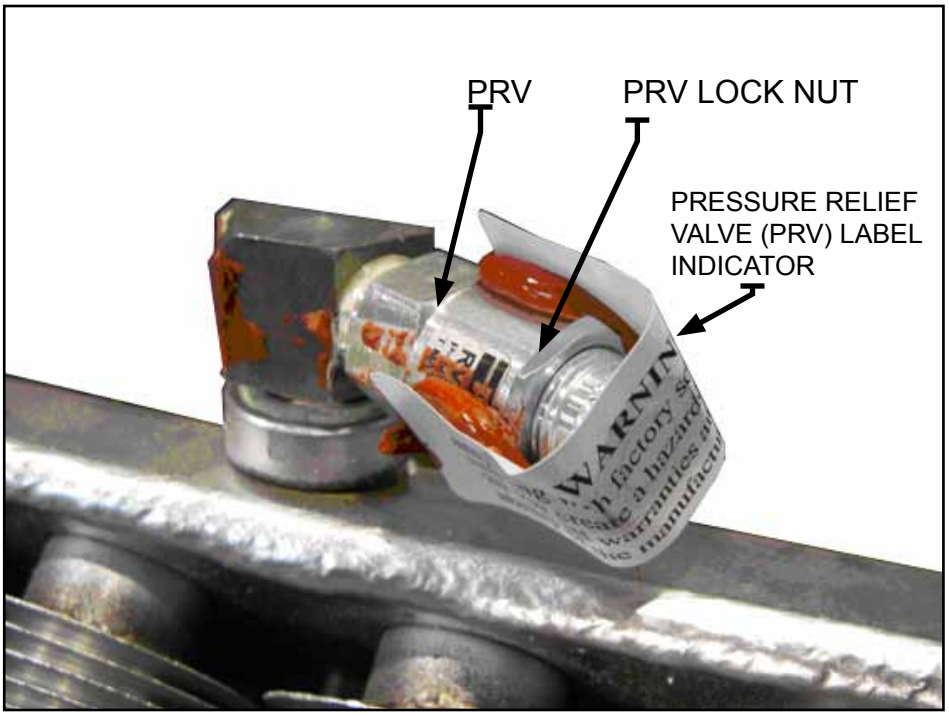


FIGURE 1

WARRANTY WILL BE VOID
IF INSTRUCTIONS ARE NOT FOLLOWED

INSTALLATION

The installation instructions provide a general guideline for the installation and wiring of the heater.
All applicable codes must be adhered to.

MECHANICAL

LOCATION

For optimum heating, the heater should be installed as follows:

1. There are no obstructions that may impede the heater's air inlet or discharge.
2. The air discharge is directed into open areas and not at occupants.
3. The air discharge is not directed at a thermostat.
4. The air discharge is directed across areas of heat loss, such as doors and windows (see Figure 1).
5. The air discharge is directed along and at a slight angle toward exterior walls (see Figure 1).
6. If equipment freeze protection is important, direct air discharge at equipment.
7. Air discharge streams support each other and create a circular air flow. It is not required that the heater's air throw reaches the next heater (see Figure 1).

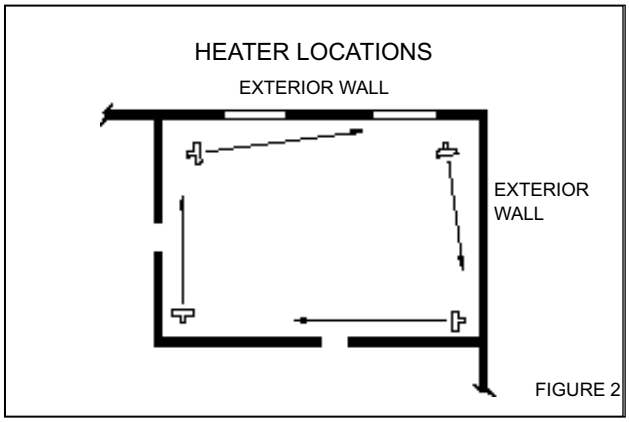


FIGURE 2

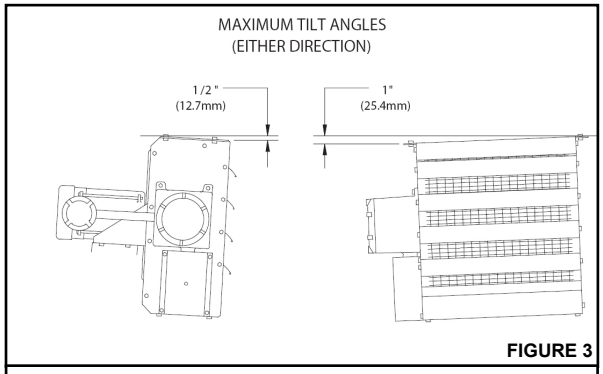
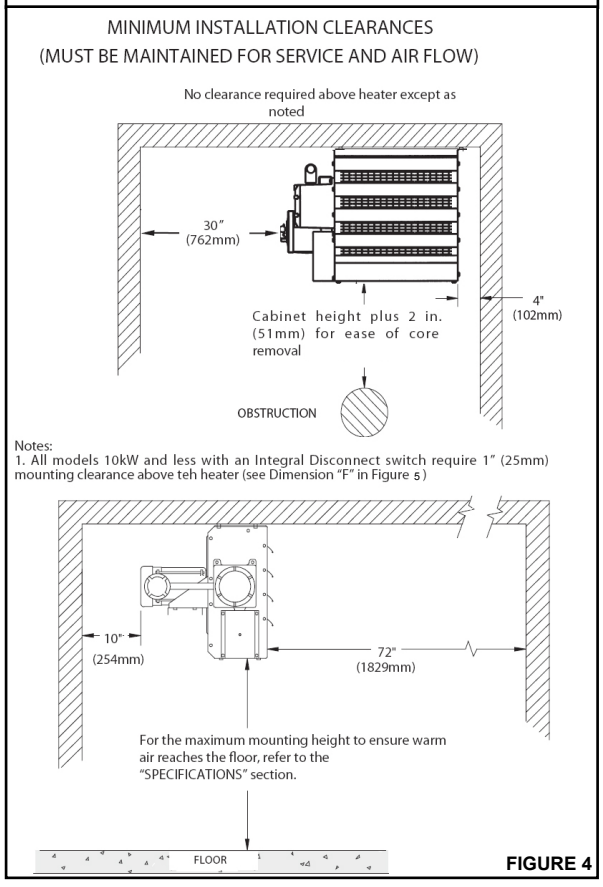


FIGURE 3


MINIMUM INSTALLATION CLEARANCES
(MUST BE MAINTAINED FOR SERVICE AND AIR FLOW)
No clearance required above heater except as noted
30"
(762mm)
Cabinet height plus 2 in. (51mm) for ease of core removal
4"
(102mm)
OBSTRUCTION
Notes:
1. All models 10kW and less with an Integral Disconnect switch require 1" (25mm) mounting clearance above teh heater (see Dimension "F" in Figure 5)
10"
(254mm)
72"
(1829mm)
For the maximum mounting height to ensure warm air reaches the floor, refer to the "SPECIFICATIONS" section.
FLOOR
FIGURE 4

MOUNTING

1. The heater must be permanently mounted in a level, upright position for operation. See Figures 2, 3, and 4 for maximum tilt angles, installation clearances, and physical dimensions. For ease of installation, a variety of mounting kits are available from the factory.
2. The mounting structure must be strong enough to:
   a. support the heater's weight, refer to the "Specifications" section,
   b. provide sufficient stiffness to prevent excessive vibration, and
   c. withstand harsh situations such as transportable installations.

DIM. \ kW		2.5 - 9.3	12.5 - 18.5	20.9 - 23.1	DIM. TOL. ±
A	in	8 - 1/16	6 - 11/16	7 - 1/16	1/8
	mm	204	170	179	3
B	in	8 - 3/16	22 -3/16	26 - 3/16	1/8
	mm	462	564	665	3
C	in	24 - 5/8	28 - 5/8	32 - 5/8	5/16
	mm	625	727	828	8
D	in	18 - 1/2	22 - 1/2	26 - 1/2	1/8
	mm	470	572	674	3
E	in	19 - 7/16	23 - 7/16	27 - 7/16	1/8
	mm	494	596	697	3

DIMENSIONAL TOLERANCES ± 0.118" (3 mm)
UNLESS OTHERWISE SPECIFIED.

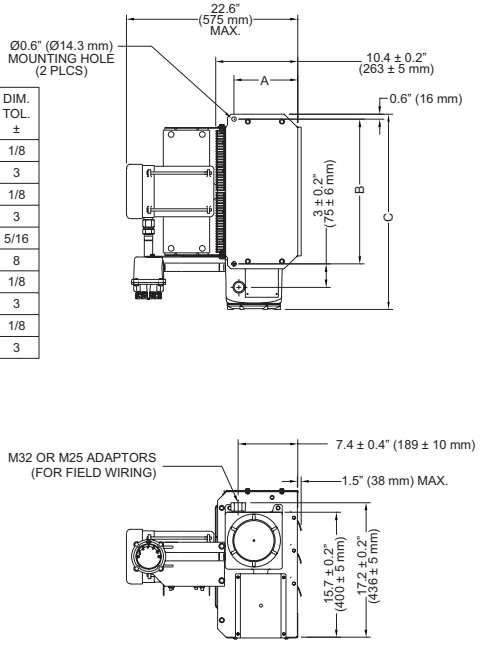


FIGURE 5

WARNING

Disconnect heater from power supply at fuse box before opening enclosures or servicing heater. Lock the switch in the "OFF" (open) position and/or tag the switch to prevent unexpected power application.

GENERAL

1. Use only copper conductors and approved explosion-proof wiring methods during installation. Refer to the “Technical Data” table and heater data plate for conductor rating.
2. External overcurrent protection is required. Refer to the “Technical Data” table and heater data plate for voltage, frequency amperage, and phase Supply voltage is to be within 10% of the data plate voltage.
3. The heater must be installed by qualified personnel in strict compliance with the electrical code.
4. All heaters come factory prewired and ready for direct connection to the power supply leads.
5. Heater control box may be supplied with two 1"-11.5 NPT conduit entries for field wiring. All unused openings shall be closed off with supplied conduit plug.
6. The heater must be individually fused, preferably with Class J time-delay fuses for maximum safety. Unless stated otherwise in your local code, fuse size shall be 125% of the line current or next size larger.

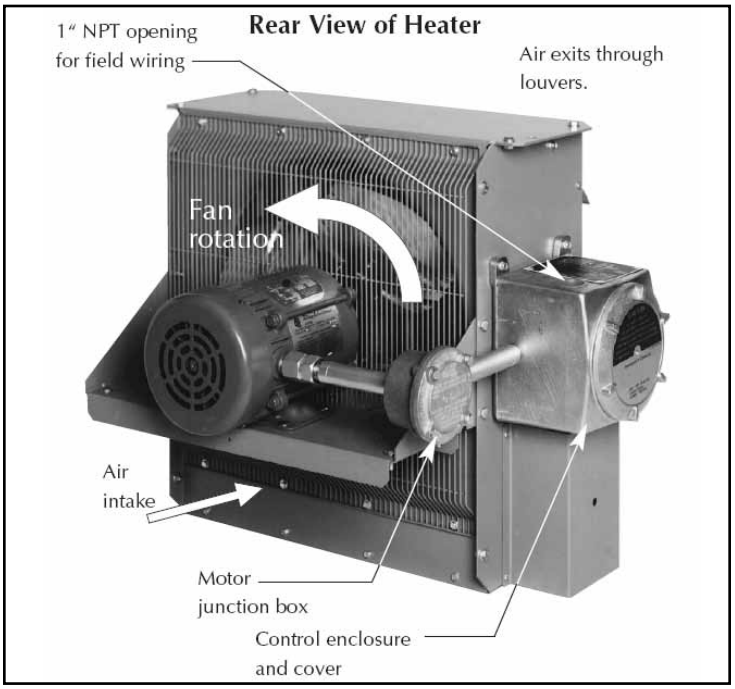
FIELD WIRING

1. The supply conductors, ground conductor, and room thermostat conductors (see point 2, page 4) all pass through the 1” NPT opening (see Figure 4) and are to be wired into the control enclosure (see Figure 5).

2. Heater may be supplied with a factory installed built-in room thermostat On heaters not supplied with this option, it is recommended that a remote room thermostat be used. Connect the remote room thermostat conductors to the printed circuit board terminal block marked “TSTAT”. Any thermostat used with this heater must:
   a. be of an explosion-proof type,
   b. be rated 125 V minimum,
   c. have a minimum 2 amp capacity, and
   d. open on temperature rise.

FINAL INSPECTION

1. Before application of electrical power:
a. Check that all connections are secured and comply with the applicable wiring diagram (see Figure 7) and code requirements,
b. Confirm that the power supply is compatible with the data plate rating of the heater,
c. Remove any foreign objects from the heater,
d. Install all covers and verify that all enclosures are well secured, and
e. Ensure that the fan rotates freely. See Figure 5 for proper direction of fan rotation.



Do not install conduit below heater (see Figure 5). **FIGURE 6**

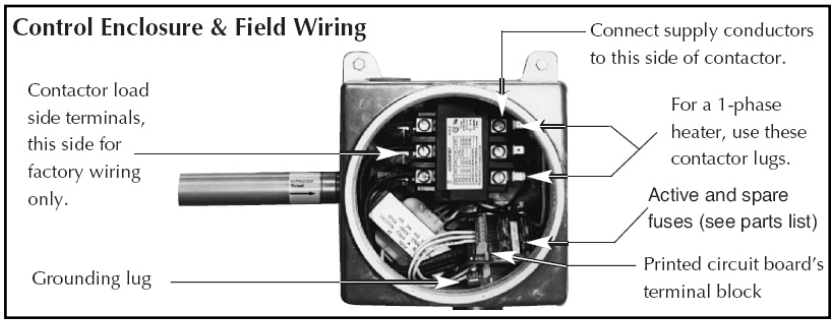

Control Enclosure & Field Wiring
Connect supply conductors to this side of contactor.
Contactor load side terminals, this side for factory wiring only.
For a 1-phase heater, use these contactor lugs.
Active and spare fuses (see parts list)
Grounding lug
Printed circuit board's terminal block

FIGURE 7

WIRING DIAGRAMS

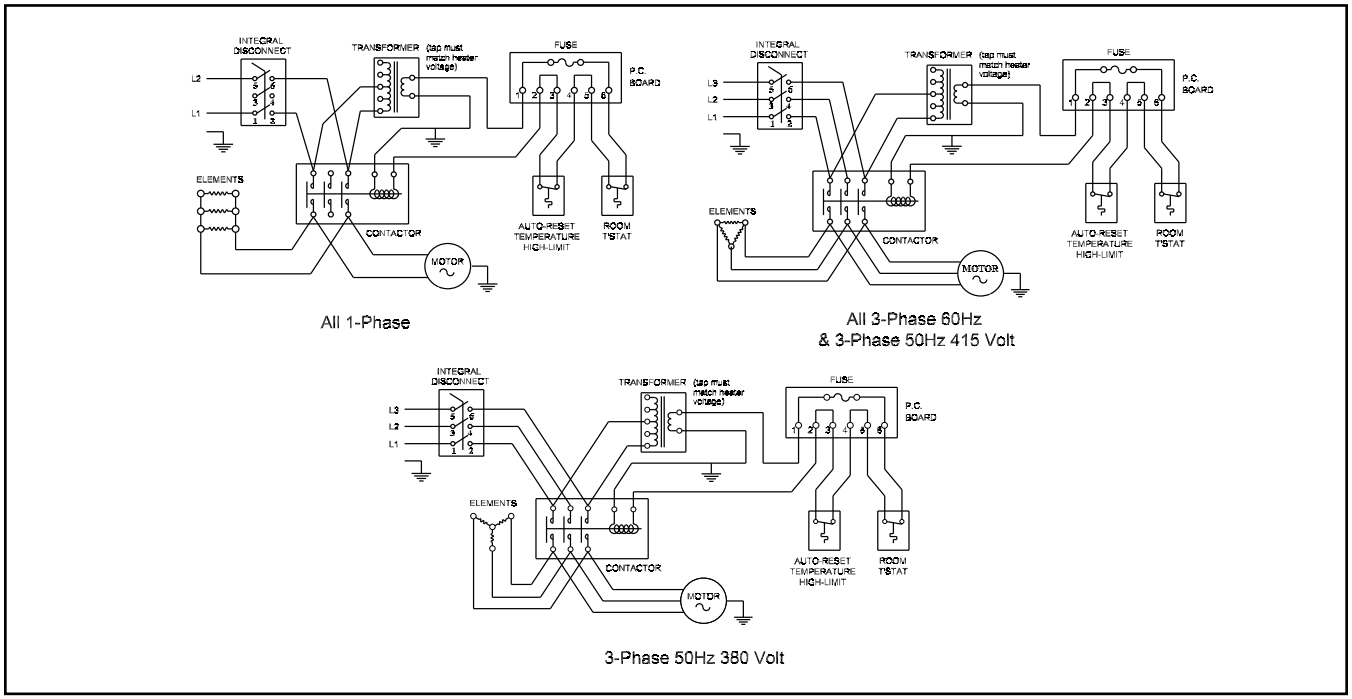


FIGURE 8

FX4 TECHNICAL DATA FOR 50 HZ ELECTRIC AIR HEATERS

MODEL	VOLTAGE (V)	NOMINAL WATTAGE (kW)	PHASE	MAX. MOTOR NAMEPLATE CURRENT (A)	HEATER WATTAGE (W)	TOTAL CURRENT (A)	MIN. CIRCUIT AMPACITY (A)	SUPPLY WIRE SIZE (AWG)	MAXIMUM FUSE SIZE (A)	TEMPERATURE RISE °F	TEMPERATURE RISE °C	CORE PART NUMBER	CONTACTOR PART NUMBER
FX4-220150-025	220	2.5	1	2.0	2,270	11.4	14.3	14	15	19.7	11.0	10410	3618
FX4-220150-042	220	4.2	1	2.0	3,950	19.1	23.9	10	25	33.2	18.4	10411	3618
FX4-220150-063	220	6.3	1	2.0	6,050	28.6	35.8	8	40	28.4	15.8	10412	3618
FX4-220150-084	220	8.4	1	2.0	8,140	38.2	47.8	6	50	37.9	21.1	10413	3618
FX4-220150-126	220	12.6	1	2.0	12,100	57.3	71.6	4	80	27.5	15.3	10424	3618
FX4-380350-025	380	2.5	3	0.7	2,260	3.8	4.8	14	15	19.7	11.0	10410	3618
FX4-380350-042	380	4.2	3	0.7	3,930	6.4	8.0	14	15	33.2	18.4	10411	3618
FX4-380350-063	380	6.3	3	0.7	6,020	9.6	12.0	14	15	28.4	15.8	10412	3618
FX4-380350-084	380	8.4	3	0.7	8,100	12.8	16.0	12	20	37.9	21.1	10413	3618
FX4-380350-125	380	12.5	3	0.7	12,030	19.0	23.8	10	25	27.2	15.1	10424	3618
FX4-380350-167	380	16.7	3	0.7	16,220	25.4	31.8	8	35	36.4	20.2	10425	3618
FX4-380350-209	380	20.9	3	1.0	20,230	31.8	39.8	8	40	22.0	12.2	10429	3618
FX4-415350-037	415	3.7	3	0.7	3,510	5.1	6.4	14	15	29.2	16.2	10415	3618
FX4-415350-075	415	7.5	3	0.7	7,240	10.4	13.0	14	15	33.9	18.8	10417	3618
FX4-415350-149	415	14.9	3	0.7	14,510	20.7	25.9	10	30	32.5	18.0	10218	3618
FX4-415350-224	415	22.4	3	1.0	21,820	31.2	39.0	8	40	23.6	13.1	10431	3618

NOTES:

1. Minimum conductor size for 30˚C (86˚F) ambient. Derate conductor for ambient temperature. Use minimum 90˚C (194˚F) insulation.
2. Heater is functioning normally if at rated voltage the amp draw is within 10% of the value in this table.
3. Operation at lower voltages will result in reduced heat output and amp draw
4. Add “T” to model number when adding a built-in thermostat

FX4 TECHNICAL DATA FOR 60 HZ ELECTRIC AIR HEATERS

MODEL	Note	VOLTAGE (V)	NOMINAL WATTAGE (kW)	PHASE	MAX. MOTOR NAMEPLATE CURRENT (A)	HEATER WATTAGE (W)	TOTAL CURRENT (A)	MIN. CIRCUIT AMPACITY (A)	SUPPLY WIRE SIZE (AWG)	MAXIMUM FUSE SIZE (A)	TEMPERATURE RISE °F	TEMPERATURE RISE °C	CORE PART NUMBER	CONTACTOR PART NUMBER
FX4-208160-030		208	3	1	2.7	2,700	14.4	18.0	12	20	19.0	10.5	10406	3618
FX4-208360-030		208	3	3	1.4	2,700	8.3	10.4	14	15	19.0	10.5	10406	3618
FX4-240160-030		240	3	1	2.7	2,700	12.5	15.6	12	20	19.0	10.5	10410	3618
FX4-240360-030		240	3	3	1.4	2,700	7.2	9.0	14	15	19.0	10.5	10410	3618
FX4-480160-030	*	480	3	1	1.3	2,700	6.3	7.9	14	15	19.0	10.5	10414	3618
FX4-480360-030		480	3	3	0.7	2,700	3.6	4.5	14	15	19.0	10.5	10414	3618
FX4-600360-030	*	600	3	3	0.6	2,700	2.9	3.6	14	15	19.0	10.5	10418	3618
FX4-208160-050		208	5	1	2.7	4,700	24.0	30.0	10	30	31.6	17.6	10407	3618
FX4-208360-050		208	5	3	1.4	4,700	13.8	17.4	12	20	31.6	17.6	10407	3618
FX4-240160-050		240	5	1	2.7	4,700	20.8	26.0	10	30	31.6	17.6	10411	3618
FX4-240360-050		240	5	3	1.4	4,700	12.0	15.0	14	15	31.6	17.6	10411	3618
FX4-480160-050	*	480	5	1	1.3	4,700	10.4	13.0	14	15	31.6	17.6	10415	3618
FX4-480360-050		480	5	3	0.7	4,700	6.0	7.5	14	15	31.6	17.6	10415	3618
FX4-600360-050	*	600	5	3	0.6	4,700	4.8	6.0	14	15	31.6	17.6	10419	3618
FX4-208160-075		208	7.5	1	2.7	7,200	36.1	45.1	6	50	27.9	15.5	10408	3619
FX4-208360-075		208	7.5	3	1.4	7,200	20.8	26.0	10	30	27.9	15.5	10408	3618
FX4-240160-075		240	7.5	1	2.7	7,200	31.3	39.1	8	40	27.9	15.5	10412	3618
FX4-240360-075		240	7.5	3	1.4	7,200	18.0	22.5	10	25	27.9	15.5	10412	3618
FX4-480160-075	*	480	7.5	1	1.3	7,200	15.6	19.5	12	20	27.9	15.5	10416	3618
FX4-480360-075		480	7.5	3	0.7	7,200	9.0	11.3	14	15	27.9	15.5	10416	3618
FX4-600360-075	*	600	7.5	3	0.6	7,200	7.2	9.0	14	15	27.9	15.5	10420	3618
FX4-208160-100	**	208	10	1	2.7	9,690	48.1	60.1	4	70	37.2	20.6	10409	3619
FX4-208360-100		208	10	3	1.4	9,690	27.8	34.8	8	35	37.2	20.6	10409	3618
FX4-240160-100		240	10	1	2.7	9,690	41.7	52.1	6	60	37.2	20.6	10413	3619
FX4-240360-100		240	10	3	1.4	9,690	24.1	30.1	8	35	37.2	20.6	10413	3618
FX4-480160-100	*	480	10	1	1.3	9,690	20.8	26.0	10	30	37.2	20.6	10417	3618
FX4-480360-100		480	10	3	0.7	9,690	12.0	15.0	14	15	37.2	20.6	10417	3618
FX4-600360-100	*	600	10	3	0.6	9,690	9.6	12.0	14	15	37.2	20.6	10421	3618
FX4-208360-150		208	15	3	1.4	14,400	41.6	52.0	6	60	27.1	15.0	10422	3619
FX4-240160-150	**	240	15	1	2.7	14,400	62.5	78.1	4	80	27.1	15.0	10424	3619
FX4-240360-150		240	15	3	1.4	14,400	36.1	45.1	6	50	27.1	15.0	10424	3619
FX4-480160-150	*	480	15	1	1.3	14,400	31.3	39.1	8	40	27.1	15.0	10426	3618
FX4-480360-150		480	15	3	0.7	14,400	18.0	22.5	10	25	27.1	15.0	10426	3618
FX4-600360-150	*	600	15	3	0.6	14,400	14.4	18.0	12	20	27.1	15.0	10427	3618
FX4-208360-200	**	208	20	3	1.4	19,410	55.5	69.4	4	70	36.1	20.1	10423	3619
FX4-240360-200	**	240	20	3	1.4	19,410	48.1	60.1	4	70	36.1	20.1	10425	3619
FX4-480160-200	*	480	20	1	1.3	19,410	41.7	52.1	6	60	36.1	20.1	10218	3619
FX4-480360-200		480	20	3	0.7	19,410	24.1	30.1	8	35	36.1	20.1	10218	3618
FX4-600360-200	*	600	20	3	0.6	19,410	19.2	24.0	10	25	36.1	20.1	10428	3618
FX4-240360-250	**	240	25	3	2.0	24,210	60.1	75.1	4	80	21.9	12.2	10429	3619
FX4-480360-250		480	25	3	1.0	24,210	30.1	37.6	8	40	21.9	12.2	10430	3618
FX4-600360-250	*	600	25	3	0.8	24,210	24.1	30.1	8	35	21.9	12.2	10433	3618
FX4-480360-300		480	30	3	1.0	29,190	36.1	45.1	6	50	26.3	14.6	10431	3619
FX4-600360-300	*	600	30	3	0.8	29,190	28.9	36.1	8	40	26.3	14.6	10434	3618
FX4-480360-350		480	35	3	1.0	34,200	42.1	52.6	6	60	28.0	15.6	10432	3619
FX4-600360-350	*	600	35	3	0.8	34,200	33.7	42.1	8	45	28.0	15.6	10435	3619

NOTES: * - CSA Certified Only **-Exceeds the 48 Amp circuit limit of NEC 424-22

1. Minimum conductor size for 30˚C (86˚F) ambient. Derate conductor for ambient temperature. Use minimum 90˚C (194˚F) insulation.
2. Heater is functioning normally if at rated voltage the amp draw is within 10% of the value in this table.
3. Operation at lower voltages will result in reduced heat output and amp draw
4. Add “T” to model number when adding a built-in thermostat

SPECIFICATIONS FOR ALL 60 Hz MODEL

		kW	3	5	7.5	10	15	20	25	30	35
Max. Altitude		(ft.)	12,000	8,000	10,000	7,000	10,000	7,000	10,000	7,000	6,000
		(m)	3,658	2,438	3,048	2,134	3,048	2,134	3,048	2,134	1,829
Air Flow	@70°F @21°C	(CFM)	500		850		1750		3600		3950
		(m^3/hr.)	850		1444		2973		6116		6711
Horizontal Air Throw		(ft.)	15		30		40		70		
		(m)	4.6		9.1		12.2		21.3		
Max. Mounting Height (to underside)		(ft.)	7		10		10		20		
		(m)	2.1		3.0		3.0		6.1		
Motor Power		(HP)	1/2				1/2		1/2		
		(kW)	0.373				0.373		0.373		
Fan Diameter		(in.)	12				16		20		
		(mm)	305				406		508		
Net Weight		(lbs.)	131				153		192		
		(kg)	59.5				69.5		87.3		
Shipping Weight		(lbs.)	180				202		241		
		(kg)	81.8				91.8		109.5		

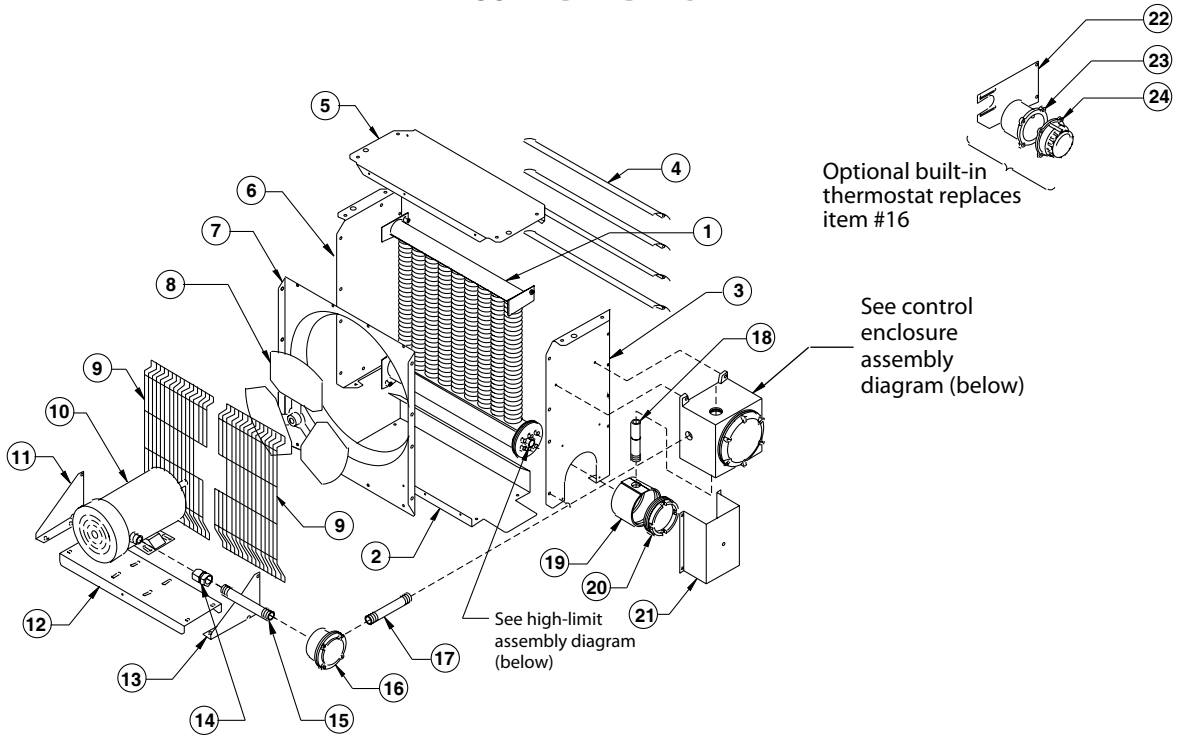
Temperature Code Rating	T3B 165°C (329°F) Class I & II.
Enclosures	NEMA Type 7 & 9. For dry, indoor use only. Do not immerse in water. Do not store or use in areas exposed to rain or snow.
Motor Type	Explosion-proof. Thermally protected. Permanently lubricated ball bearings. 1725 RPM
Fan	Aluminum blade, Steel spider and hub with 5/8 in. (15.875 mm) bore.
Fan Guard	Split design with close wire spacing. 1/4 in. (6.3 mm) dia. probe will not enter
Mounting Holes	Two 9/16 in. (14.3 mm) diameter holes at top of heater.
Heating Elements	Three long-life, low watt-density, high grade metal-sheathed elements.
Temperature High-Limit	Automatic reset type, snap-action bimetal, open on temperature rise. Rated 100,000 cycles at 10 amps, handles 0.128 amps.
Control Circuit	120 Volts, 0.128 amps, 15VA. (Grounded)
Optional Built-in Thermostat	Explosion-proof. 2°C to 28°C (36°F to 82°F)
Control Transformer	Multi-tap primary, 120 V secondary, 25 VA.
Contactor	40 or 75 amp. Rated for 500,000 mechanical operations. 120 Volts, 15VA coil (separately fuse-protected).
Heat Transfer Fluid	Long life formulated propylene glycol and water.
Cabinet Material	14 ga. (0.075 in.) (1.9 mm) steel. Epoxy coated with five-stage pretreatment
Core	Steel with integral aluminum fins, vacuum charged and hermetically sealed.
Conduit Material	Heavy walled, 0.122 in. (3.1 mm) steel.
Overpressure Protection	Preset 100 psig (690 kPa) seep pressure relief valve, aluminum body, no field serviceable parts
Operational Temperature Limitations	-20°C to 40°C (-4°F to 104°F)
Storage Limitations	-45°C to 80°C (-49°F to 176°F), short term to 120°C (248°F). Do not immerse in water. Do not expose to rain or snow.

SPECIFICATIONS FOR ALL 50 Hz MODEL

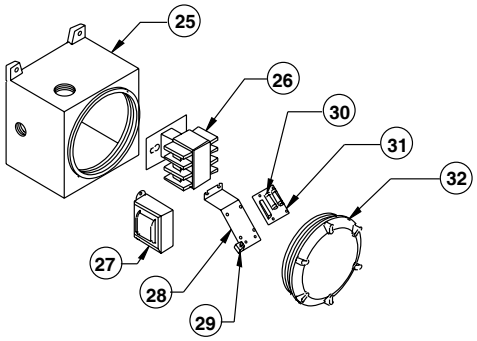
	kW	2.5	3.7&4.2	6.3&7.5	8.4	12.5&12.6	14.9&16.7	20.9	22.4
Max. Altitude	(ft.)	12,000	8,000	10,000	7,000	10,000	7,000	10,000	7,000
	(m)	3,658	2,438	3,048	2,134	3,048	2,134	3,048	2,134
Air Flow @70°F @21°C	(CFM)	400		700		1450		3000	
	(m3/hr.)	679		1189		2463		5096	
Horizontal Air Throw	(ft.)	13		25		35		60	
	(m)	4.0		7.6		10.7		18.2	
Max. Mounting Height (to underside)	(ft.)	7		10		10		20	
	(m)	2.1		3.0		3.0		6.1	
Motor Power	(HP)	1/2				1/2		1/2	
	(kW)	0.373				0.373		0.373	
Fan Diameter	(in.)	12				16		20	
	(mm)	305				406		508	
Net Weight	(lbs.)	131				153		192	
	(kg)	59.5				69.5		87.3	
Shipping Weight	(lbs.)	180				202		241	
	(kg)	81.8				91.8		109.5	

Temperature Code Rating	T3B 165°C (329°F) Class I & II
Enclosures	NEMA Type 7 & 9. For dry, indoor use only. Do not immerse in water. Do not store or use in areas exposed to rain or snow.
Motor Type	Explosion-proof. Thermally protected Permanently lubricated ball bearings. 1425 RPM.
Fan	Aluminum blade. Steel spider and hub with 5/8 in. (15.875 mm) bore.
Fan Guard	Split design with close wire spacing. 1/4 in. (6.3 mm) dia. probe will not enter.
Mounting Holes	Two 9/16 in. (14.3 mm) diameter holes at top of heater.
Heating Elements	Three long-life, low watt-density, high grade metal-sheathed elements.
Temperature High-Limit	Automatic reset type, snap-action bimetal, open on temperature rise. Rated 100,000 cycles at 10 amps, handles 0.130 amps.
Control Circuit	115 Volts, 0.130 amps, 15VA. (Grounded)
Optional Built-in Thermostat	Explosion-proof. 2°C to 28°C (36°F to 82°F)
Control Transformer	Multi-tap primary, 115 V secondary, 25 VA.
Contactor	40 or 75 amp. Rated for 500,000 mechanical operations. 120 Volts, 15VA coil (separately fuse-protected).
Heat Transfer Fluid	Long life formulated propylene glycol and water.
Cabinet Material	14 ga. (0.075 in.) (1.90 mm) steel. Epoxy coated with five-stage pretreatment, including iron phosphate.
Core	Steel with integral aluminum fins, vacuum charged and hermetically sealed.
Conduit Material	Heavy walled, 0.1222 in. (3.1 mm) steel.
Overpressure Protection	Preset 100 psig (690 kPa) seep pressure relief valve, aluminum body, no field servicable parts.
Operational Temperature Limitations	-20°C to 40°C (-4°F to 104°F)
Storage Limitations	-45°C to 80°C (-49°F to 176°F), short term to 120°C (248°F). Do not immerse in water. Do not store or use areas exposed to rain or snow.

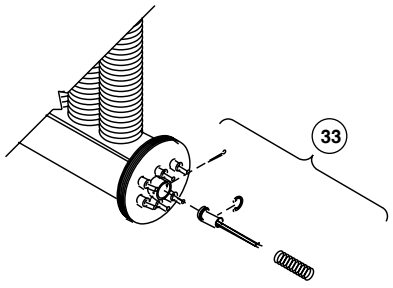
HEATER ASSEMBLY DIAGRAM



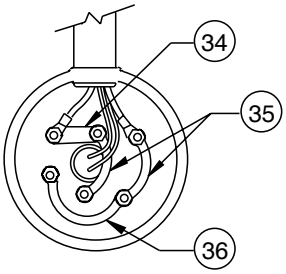
CONTROL ENCLOSURE
ASSEMBLY DIAGRAM



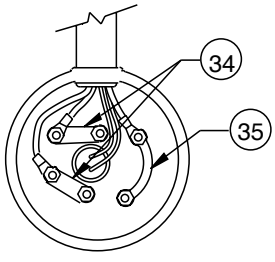
HIGH LIMIT
ASSEMBLY DIAGRAM



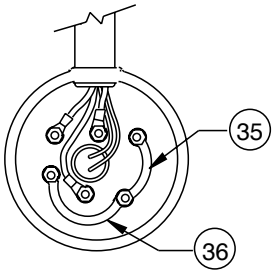
BUS-BAR CONFIGURATION
ALL 1-PHASE MODELS



BUS-BAR CONFIGURATION
ALL 3-PHASE 60 HERTZ & 3-PHASE 50 HERTZ 415 VOLT MODEL



BUS-BAR CONFIGURATION
3-PHASE 380 VOLT 50 HERTZ MODELS ONLY



PARTS LIST

FORCED AIR ELECTRIC HEATERS

	PART NUMBERS			Please have model and serial number available before calling.
ITEM	**2.5 - 10 kW**	**12.5 - 20 kW**	**20.9 - 35 kW**	**Description**
1	–	–	–	Core
2	3773	3774	3775	Panel, Bottom
3	3776	3777	3778	Panel, Left Side
4	4075	4076	4077	Louver Kit, c/w Screws
5	3770	3771	3772	Panel, Top
6	3779	3780	3781	Panel, Right Side
7	3782	3783	3784	Fan Shroud
8	2.5 - 5 kW: 4022 6.3 - 10 kW: 4023	4024	4025	Fan
9	4078	4079	4080	Fan Guard Kit
10	208/240V 60 HZ 1 PH: 1979/10388 220V 50 HZ 1 PH: 1979/10388 480V 60 HZ 1 PH: 9896 208/240/480V 60 HZ 3 PH: 1699/10387 380/415V 50HZ 3 PH: 1699		240/480V 60 HZ 3 PH: 1699 380/415V 50 HZ 3 PH: 1699 600V 60 HZ 3 PH: 2433/10672	Motor, Explosion-Proof
11	3789	3789	3789	Bracket, Motor Mount Right
12	3785	3786	3787	Channel, Motor Mount
13	3788	3788	3788	Bracket, Motor Mount Left
14	3737/4590	3737/4590	3737/4590	Coupling, Motor
15	3811	3812	3813	Conduit, Motor
16	4983	4983	4983	Enclosure, Conduit Junction
17	208/240V 60 HZ 1 PH: 3813 220V 50 HZ 1 PH: 3813 480V 60 HZ 1 PH: 3813 ALL 3 PH: 3813		3813	Conduit, Control Enclosure
18	3810	3810	3810	Conduit, Element Enclosure
19	3793	3793	3793	Enclosure, Element
20	3510	3510	3510	Cover, Element Enclosure
21	3790	3790	3790	Panel, Element Enclosure guard
22	4983	4983	4983	Enclosure, Thermostat
23	5032	5032	5032	Thermostat, Built-in Kit
24	3524	3525	3526	Enclosure, Control
25	10557	10557	10557	Contactor
26	10556	10556	10556	Transformer
27	3809	3809	3809	Bracket, Printed Cuircuit Board
28	1876	1876	1876	Terminal, 6-14 ga. Screw Lug
29	3519	3519	3519	Fuse, Buss MDQ-1/4 Amp
30	3514	3514	3514	Printed Circuit Board Assembly
31	3516	3516	3516	Cover, Control Enclosure
32	4082	4082	4082	Temperature High-Limit Kit
33	3816	3816	3816	Bus-Bar, Straight
34	3817	3817	3817	Bus-Bar, Small Curved
35	3818	3818	3818	Bus-Bar, Large Curved

REPAIR & REPLACEMENT

WARNING

Disconnect heater from power supply at fuse box before opening enclosures or servicing heater. Lock the switch in the "OFF" (open) position and/or tag the switch to prevent unexpected power application.

1. After repairing any component:
   a. check that electrical connections are correct and secure (see Figure 8),
   b. remove any foreign material from enclosures,
   c. install and secure all covers,
   d. ensure that all fasteners are tight,
   e. remove all foreign objects from heater, and
   f. ensure air exits through louvers and fan rotates counterclockwise when viewed from rear of heater (see Figure 13).

CORE

The heater core is vacuum charged and not field repairable.
For core removal:

1. Remove cabinet bottom and element enclosure cover.
2. Disconnect all wires entering element enclosure (see Figure 9).
3. Slightly loosen all cabinet bolts shown in Figure 9, to prevent the core from binding.
4. With an assistant supporting the weight of the core, remove the 3 core mounting bolts. Carefully lower the core out of the cabinet (see Figure 10).
5. To return core to factory, use crate supplied with exchange core to protect the element terminals and plate threads.
6. To reinstall, lift the core up into cabinet while an assistant guides the element wires into the element enclosure conduit.
7. Position the core and tighten the 3 core mounting bolts. Tighten the remaining cabinet bolts.

TEMPERATURE HIGH-LIMIT

1. Remove temperature high-limit assembly and clean the inside of the thermowell (see Figure 11). A clean thermowell will ensure good thermal contact.
2. Use only a factory supplied temperature high-limit to ensure safe operation. (refer to the instructions that accompany the replacement Temperature High-Limit kit).
3. Reinstall the temperature high-limit assembly with the snap ring and spring into the thermowell without damaging the insulating tube. Secure in place with the cotter pin (see Figure 12).

MOTOR, FAN & FAN GUARD

1. Remove bolts holding the motor to the motor mount. On units with a built in thermostat, remove the bolts on the back of the thermostat enclosure.
2. Remove conduit #1 located between motor junction box and control enclosure by turning it in the direction illustrated (see Figure 13). Note conduits #1 and #2 are not interchangeable and have left hand threads on one end, this end is indicated by a machined groove.
3. Remove the 2 piece fan guard assembly (see Figure 14).
4. Lift the motor assembly off the motor mount.
5. Before removing the fan, measure and record the location of the fan hub on the motor shaft (see Figure 15). If difficult to remove, use a gear puller on the fan hub.
6. To reassemble, place motor assembly onto motor mount and fasten the fan guard to cabinet.
7. Simultaneously engage and tighten both ends of conduit #1 into enclosures. Leave a 1/16" to 3/16" (1.6 to 4.8 mm) gap between the motor and fan guard (see Figure 16). Adjust conduit #2 to center the fan in the shroud.
8. To ensure a minimum 5 thread engagement, threaded ends of conduits must protrude a minimum of 1/16" (1.6mm) into enclosures. The groove on conduit #2 must not be more than 7/8" (22mm) from motor coupling (see Figure 13).
9. Bolt motor to motor mount. Manually spin the fan blade to ensure fan rotates freely
10. Air must exit through louvers and fan must rotate counterclockwise when viewed from rear of heater (see Figure 13).

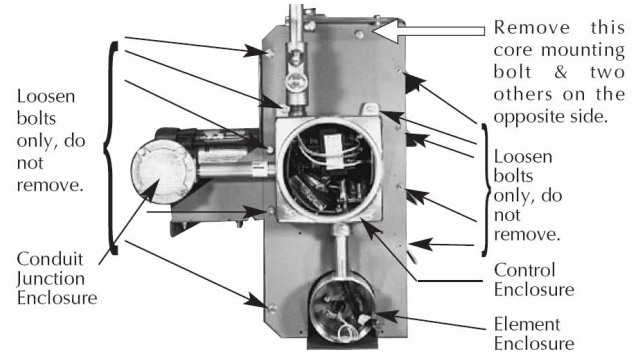

Remove this core mounting bolt & two others on the opposite side.
Loosen bolts only, do not remove.
Loosen bolts only, do not remove.
Conduit Junction Enclosure
Control Enclosure
Element Enclosure

FIGURE 9

FIGURE 10

FIGURE 11

FIGURE 12

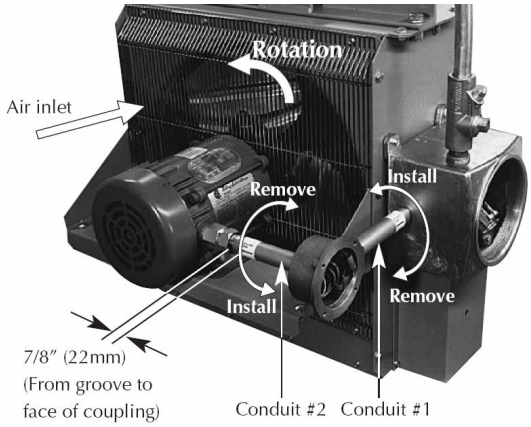


FIGURE 13

FIGURE 14

FIGURE 15

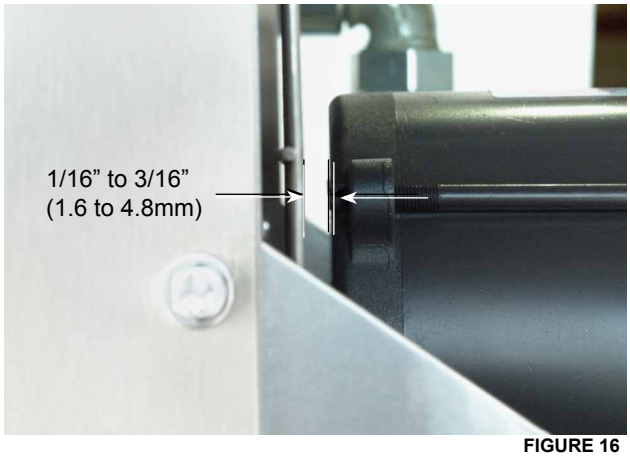


FIGURE 16

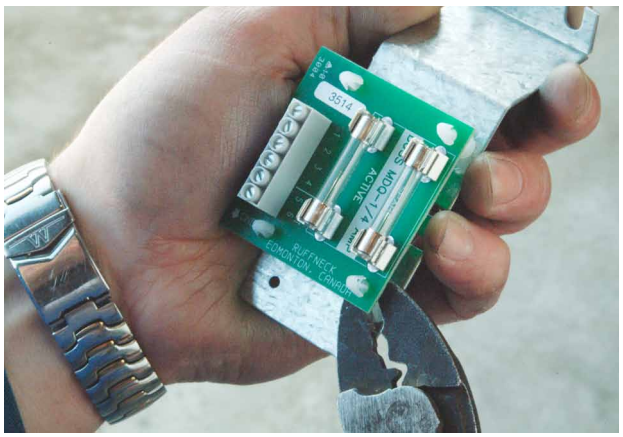


FIGURE 17

PRINTED CIRCUIT BOARD

1. After removing the printed circuit board (PCB) bracket assembly from the control enclosure, separate the PCB from the bracket by cutting off the plastic spacers (see Figure 17).
2. Reinstall a new factory supplied PCB onto the mounting bracket using new non-conducting spacers of the same length. Spacers are supplied with a new PCB. Reinstall the control circuit ground wire to the printed circuit board bracket (see Figure 8).

CONTACTOR

1. Loosen, but do not remove contactor mounting screws. Slide contactor off mounting screws.
2. Replace with a factory supplied contactor of the same rating.

TRANSFORMER

1. Replace with a factory supplied transformer of the same rating.
2. On the new transformer, select primary wires to match heater voltage. Ensure that the correct transformer secondary lead is grounded (see Figure 8). Individually terminate all unused wires using closed end connectors.

FUSE

Replace fuse with one of the same type and rating as indicated on P.C. Board or refer to parts list. An extra fuse should be stored in the clips marked “SPARE”.

HEATING ELEMENTS

Heating elements are an integral part of the vacuum charged core. A factory exchange core can be shipped immediately from stock. Refer to “Core” section for details.

CABINET PANELS

Bolt-on cabinet panels are individually replaceable.

NOTES

NOTES

Ruffneck™
Heaters for the Harshest Environments
5918 Roper Road, Edmonton, Alberta, Canada T6B 3E1
Phone: (780) 466-3178 Fax: (780) 468-5904

PLEASE ADHERE TO INSTRUCTIONS PUBLISHED IN THIS MANUAL.
Failure to do so may be dangerous and may void certain provisions of your warranty.
For further assistance, please call:

24 Hr. Hotline: 1-800-661-8529

(U.S.A. and Canada)

Please have model and serial numbers available before calling.

WARRANTY: Under normal use the Company warrants to the purchaser that defects in material or workmanship will be repaired or replaced without charge for a period of 18 months from date of shipment, or 12 months from the start date of operation, whichever expires first. Any claim for warranty must be reported to the sales office where the product was purchased for authorized repair or replacement within the terms of this warranty.

Subject to State or Provincial law to the contrary, the Company will not be responsible for any expense for installation, removal from service, transportation, or damages of any type whatsoever, including damages arising from lack of use, business interruptions, or incidental or consequential damages.

The Company cannot anticipate or control the conditions of product usage and therefore accepts no responsibility for the safe application and suitability of its products when used alone or in combination with other products. Tests for the safe application and suitability of the products are the sole responsibility of the user.

This warranty will be void if, in the judgment of the Company, the damage, failure or defect is the result of:

- vibration, radiation, erosion, corrosion, process contamination, abnormal process conditions, temperature and pressures, unusual surges or pulsation, fouling, ordinary wear and tear, lack of maintenance, incorrectly applied utilities such as voltage, air, gas, water, and others or any combination of the aforementioned causes not specifically allowed for in the design conditions or
- any act or omission by the Purchaser, its agents, servants or independent contractors which for greater certainty, but not so as to limit the generality of the foregoing, includes physical, chemical or mechanical abuse, accident, improper installation of the product, improper storage and handling of the product, improper application or the misalignment of parts.

No warranty applies to paint finishes except for manufacturing defects apparent within 30 days from the date of installation.

The Company neither assumes nor authorizes any person to assume for it any other obligation or liability in connection with the product(s).

The Purchaser agrees that all warranty work required after the initial commissioning of the product will be provided only if the Company has been paid by the Purchaser in full accordance with the terms and conditions of the contract.

The Purchaser agrees that the Company makes no warranty or guarantee, express, implied or statutory, **(INCLUDING ANY WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE)** written or oral, of the Article or incidental labour, except as is expressed or contained in the agreement herein.

LIABILITY: Technical data contained in the catalog or on the website is subject to change without notice. The Company reserves the right to make dimensional and other design changes as required. The Purchaser acknowledges the Company shall not be obligated to modify those articles manufactured before the formulation of the changes in design or improvements of the products by the Company.

The Company shall not be liable to compensate or indemnify the Purchaser, end user or any other party against any actions, claims, liabilities, injury, loss, loss of use, loss of business, damages, indirect or consequential damages, demands, penalties, fines, expenses (including legal expenses), costs, obligations and causes of action of any kind arising wholly or partly from negligence or omission of the user or the misuse, incorrect application, unsafe application, incorrect storage and handling, incorrect installation, lack of maintenance, improper maintenance or improper operation of products furnished by the Company.

Edmonton Head Office	Oakville	Orillia	Greensburg	Houston
1-800-661-8529	1-800-410-3131	1-877-325-3473	1-800-473-2402	1-855-219-2101
(780) 466-3178	(905) 829-4422	(705) 325-3473	(812) 663-4141	(281) 506-2310
F 780-468-5904	F 905-829-4430	F 705-325-2106	F 812-663-4202	F 281-506-2316